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not be stated that the model clears them all up, but it shows the broader features admirably and will be later described in greater fullness.

The speaker gave some further details of the geological relations of the ore and the character of the rocks as shown by drill cores. The presence of intruded sheets of gabbro in the gneisses was especially emphasized, and in particular their existence as proved by the cores, immediately beneath some thin beds or veins of ore. The paper was further illustrated by a large series of lantern slides of the mines.

The second paper, by G. van Ingen, on 'The significance of the recent studies of Mr. G. F. Matthew on Cambrian Faunas as published by the Academy,' covered practically the same ground as did Mr. Matthew's abstract printed in *SCIENCE* April 26, p. 452. Mr. van Ingen added many additional particulars based on his field experience in collecting the fossils, and also exhibited comparative sections of the Cambrian in both Europe and America.

The third paper, by W. D. Matthew, 'The Effusive and Dike Rocks, near St. John, N. B.,' was postponed on account of the lateness of the hour. It appears, however, in full in the Transactions of the Academy, and adds much to our knowledge of the Pre-Cambrian volcanic rocks of New Brunswick.

J. F. KEMP,  
*Recording Secretary.*

#### SCIENTIFIC JOURNALS.

##### THE PHYSICAL REVIEW.

Vol. II., No. 6. May-June, 1895.

*The Capacity of Electrolytic Condensers:* By SAMUEL SHELDON, H. W. LEITCH and A. N. SHAW.

This paper contains a description of experiments performed upon two types of Platinum— $H_2SO_4$  cells, which, when charged to potentials less than the E. M. F. of polarization, are found to act as con-

densers. The capacity of such condensers is dependent upon the impressed E. M. F. as well as upon the surface and character of the electrodes. By a method quite analogous to the 'ballistic method' of testing iron the authors have shown the presence of a very considerable hysteresis in the relation between potential and charge. The curves showing this relation present in fact a striking resemblance to the ordinary hysteresis loop. Considerable difficulty was met with in reducing the electrodes to an unpolarized condition, even with new specimens of platinum. Here also an application of magnetic methods was found useful, the cells being conveniently depolarized by reversals. The paper contains also an investigation of the effect of temperature and concentration upon the capacity. In spite of the large capacity of electrolytic condensers, the authors are of the opinion that the high temperature coefficient and low efficiency of such cells are prohibitive to practical usage.

*Thermal Conductivity of Copper, I.* By R. W. QUICK, C. D. CHILD and B. S. LANPHEAR.

In this article is begun the description of observations made to determine the thermal conductivity of a bar of copper intended for use as a standard of length. The method used was that of Forbes. The measurement of the temperature at different points of the bar was made by a method different from that usually employed, and depended upon the variation in the resistance of a coil of fine copper wire, which could be shifted from point to point throughout the length of the bar. Results were obtained for the conductivity through a range of temperatures extending from  $74^\circ$  to  $167^\circ$ , the extreme values being 0.914 at the lower of these two temperatures and 1.024 at the higher. Observations at temperatures below  $0^\circ$  will appear in a subsequent article.

*On the Absorption of Certain Crystals in the Infra-red as Dependent Upon the Direction of the Plane of Polarization.* By ERNEST MERRITT.

By means of a spectro-bolometer the writer has determined the transmission curves for Quartz, Iceland Spar, and Turmalin out to a wave length of  $5.5 \mu$ . In order to detect the differences between the absorption of the ordinary and extraordinary rays the radiation used (that of a Zirconium lamp) was polarized by reflection before passing through the crystal specimen. On account of diffuse rays from the surface of the fluorite prism considerable difficulty was met with in obtaining a pure spectrum; a difficulty which was finally met by using two spectrometers 'in series;' *i. e.*, the spectrum formed by one spectrometer was thrown upon the slit of another. The results show that the transmission curves of the ordinary and extraordinary rays are entirely independent in all three cases. In the case of Iceland Spar the differences between the two curves is especially marked, sharp absorption bands being present in the one curve which are entirely absent in the other. At  $\lambda = 3.3 \mu$  Iceland Spar is found to behave as turmalin, *i. e.*, the ordinary ray is suppressed, while the extraordinary ray is transmitted in considerable amount. The difference between the two curves is less marked in the case of Quartz, but is very considerable with Turmalin. In the latter case the two curves are found to intersect, and in the region lying between the points of intersection the dechroism of turmalin is reversed.

*Resonance in Transformer Circuits.* By F. BEDELL and A. C. CREHORE.

In this article the writers discuss the action of a condenser in either circuit of a transformer, and develop by purely graphical methods the conditions necessary for primary resonance due to a secondary condenser, a

phenomenon to which Dr. Pupin has given the name electrical consonance. A primary circuit alone, and with no condenser, would have no natural period of oscillation; but it may have such a period when a neighboring secondary circuit contains a condenser. The elastic influence of the condenser is transferred from one circuit to the other, on account of their mutual relationship; and the natural period of the primary circuit depends not only upon the value of its own constants, but those of the secondary as well. There is a surging of energy back and forth between the primary circuit and the secondary condenser by intervention of their common magnetic field; the period of these surgings determines the period of the system. In addition to the graphical analysis, Drs. Bedell and Crehore subject the problem to a brief analytical treatment leading to identical results. It is shown that there are two values of the capacity of the secondary condenser which will give rise to consonance. It is pointed out that a condenser in the secondary of the transformer may compensate for the drop due to magnetic leakage; in fact, this drop may be over-compensated for, so that the secondary potential will actually rise as the transformer is loaded down.

Aside from the particular conclusions reached, the paper is of interest for the methods employed, the problem in hand illustrating well the writer's method of reciprocal points in constructing admittance and current diagrams from diagrams of impedance and electromotive forces.

*On the Secular Motion of a Free Magnetic Needle, I.* By L. A. BAUER.

This article forms the introduction to an important paper on the secular variation of terrestrial magnetism which will be concluded in the next number. The present article is devoted to a description of the

methods of accumulating and discussing the available data. An abstract is postponed until the appearance of the remainder of the paper.

*New method of Testing the Magnetic Properties of Iron.* BY W. S. FRANKLIN.

In determining the curve of magnetization, the sample, in the form of a long narrow  $\eta$ , is suspended from the arm of a balance, the legs of the  $\eta$  being surrounded by fixed magnetizing coils. The induction may then be calculated from the weight necessary to hold the specimen in equilibrium. A novel method of determining hysteresis loss is also described. In this case the sample was in the form of a long rod, and was magnetized by a rather short coil. The rod was suspended from one part of a balance, and was weighed first while the coil was moved slowly upward and afterwards during a slow downward motion of the coil. A method is developed by which the hysteresis loss may be computed from the difference of these weights. Experimental data accompany the paper.

*New Books.* The following books are reviewed: RAYLEIGH. *Theory of Sound*, Vol. I. POINCARÉ. *Les Oscillations Electriques*. CARHART. *University Physics*.

THE JOURNAL OF COMPARATIVE NEUROLOGY.

THE Journal of Comparative Neurology for March contains three original papers. The first, 'Modern Algedonic Theories,' by C. L. Herrick, is a critique based primarily upon Marshall's Pain, Pleasure and Æsthetics, though most of the other recent literature is reviewed in the same connection. The physiological theory of emotion finally adopted by the writer is in the main a composite drawn chiefly from the nutrition theory of Meynert, the discharge theory of Lange and James, and the theory of habit of Gilman. In brief, it is a resistance theory. When we have agreed upon the

nature of the simplest sense, pain and gratification, the foundation will have been laid for the more complex æsthetic phenomena. This foundation is believed to consist in the recognition of a special kind of neurosis for the feelings due to two classes of stimuli of a very similar but not identical kind. Given an excessive stimulus which for whatever reason freely irradiates, and pleasure is felt; given another stimulus, or the same excessive stimulus with other neural conditions which prevent irradiation and produce a summation and overflow, and pain is felt. Emotion consists (1) of general sensations of total, organic or irradiating varieties which have in common a lack of localization and, as a result of associational laws, are amalgamated more or less closely with the empirical ego; (2) of more or less explicate or implicate cognitions (perceptions, intuitions) of the relation between the cause of the sensation and our well-being; (3) the emotion is more or less closely attached to various impulsive expressions which tend in various ways to intensify the two preceding. The psychical element of emotion is essentially intellectual, and the attempt to secure a serial relation of the 'faculties' must be abandoned.

The second paper by M. A. Raffalovich deals with 'Uranism, or Congenital Sexual Inversion.' It is a plea for the early recognition of congenital inversion in children and the proper education of such children. Inversion is no excuse for debauchery and Krafft-Ebbing's pity for the race of inverted persons is largely misplaced. The psychological history of a superior uranist is traced and commented upon at length.

In a brief paper entitled 'The Histogenesis of the Cerebellum,' C. L. Herrick notices the recent work of Dr. Shaper upon the cerebellum of teleosts and calls attention to the gratifying harmony between these results and his own studies published in 1891.